

Management Advice for Broiler Production when Minimizing or Removing Antibiotics

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Introduction

In recent years, there has been a growing consumer perception that the use of antibiotics in food-producing animals has contributed to antibiotic resistance in humans. Due to general concerns about the potential transfer of antimicrobial resistance from animals used for food production to humans, many countries are being asked to reduce or eliminate the use of antibiotics in poultry.

This document presents advice for producers who aim to minimize antibiotic use in broiler production and is based on the experience and expertise of those with practical knowledge of this situation. It is intended to provide information that allows good-quality broiler chicks with as little microbial challenge as possible to be delivered to the farm and grown without the routine use of antibiotics.

Aviagen fully supports the rights of a licensed veterinarian to treat a sick animal or flock with an approved antibiotic to control disease and prevent pain and suffering as stated by the AAAP (American Association of Avian Pathologists) and referred to in the BVPA (British Veterinary Poultry Association) Antimicrobial Guidelines.

Broiler Production

Farm preparation and biosecurity

The biosecurity of all broiler farms should be a primary focus, but is especially important for flocks grown without antibiotics. The spread of disease can be controlled by minimizing the span of broiler ages across the farm (an all in/all out system is considered best practice) and by preventing diseases from entering the farm via humans, animals or fomites (equipment, clothing, etc.). Potential bird health issues can be identified by daily observations, accurate recording and systematic disease monitoring.

Thorough cleaning and disinfection of the house, as well as an appropriate downtime, is best practice for all poultry. Pay close attention to the house, using effective detergents and/or hot water to remove any grease or organic material that may be present. Pay special attention to the floors. All surfaces and equipment should be sufficiently cleaned and given a final disinfection. After cleaning and disinfection is complete, it is good practice to check the floors for Total Viable Count (TVC), Salmonella and E. coli to test the efficacy of the cleaning and disinfection process. Recommended levels of TVC should be less than 10 colony forming units per centimeter squared (cfu/cm²) and E.coli and Salmonella levels should be undetectable.

Clean and sanitize water systems with approved products to remove biofilms. Check them for TVC, E.coli, enterobacteriaceae, mold and yeast levels using swab and water samples. The recommended level for TVC in the water system should be less than 10 colony forming units per milliliter (cfu/ml), and E.coli, enterobacteriaceae, mold and yeast levels should be undetectable. After 7 days, obtain a water sample at the end of the water line and test it for TVC, E.coli, enterobacteriaceae, mold and yeast. Counts should still be <10 cfu/ml for TVC and undetectable for all others. Chlorinating or sanitizing the water and controlling water pH will help to control bacterial growth. Flush drinking lines weekly from placement through to depletion to ensure that water does not become stale and to remove any build-up of biofilms from the lines.

Only litter that has been tested or is certified to have a TVC of less than 10 colony forming units per gram (cfu/g) should be used in the house. Spread approved litter material to a depth of 5-10 cm (2-4 in). Heat the house to an air temperature of 30°C (86°F) at least 24 hours prior to chick placement, with the litter temperature being 28-30°C (82-86°F). Relative humidity (RH) should be 60-70% and temperature and RH monitored routinely to ensure a uniform environment. For more information on the broiler house environment, please see the **Broiler Management How To - Monitor Temperature and Relative Humidity**.

Brooding and management

For information on hatchery management in regards to flocks that minimize the use of antibiotics, please see the **Aviagen Brief - Management Advice for Parent Stock with Minimal Antibiotic Use**.

Deliver the chicks to the broiler farm as soon as possible after hatching and provide immediate access to feed. Provide chicks with the correct environment and manage the brooding conditions to meet all of their nutritional and physiological requirements. Meeting these requirements promotes early development of feeding and drinking behavior and optimizes gut, organ and skeletal development to support body-weight gain throughout the growing period. By monitoring crop fill (aiming to achieve >95% by 24 hours) (**Figure 1, Table 1**) and reaching 7-day body-weight targets, chicks will be better prepared to face the challenge of coccidiosis in areas that do not allow coccidiostats in the feed, as well as be better equipped to respond to the reaction of coccidial vaccines.

Figure 1: Assessing crop fill of chicks with a full, rounded crop (left) and an empty crop (right).



Table 1: Crop fill assessment guidelines.

Time of Crop Fill After Placement	Target Crop Fill (% of Chicks with Full Crops)
2 hours	75
4 hours	80
8 hours	>80
12 hours	>85
24 hours	>95
48 hours	100

As birds age, keep feeding and drinking space, light intensity, stocking density and other environmental conditions to the recommended specifications so that birds are comfortable and free from situations (temperatures being too high or low, poor feed management or poor ventilation) that impact comfort, health, and well-being. Unnecessary situations impacting the birds can cause potential intestinal challenges leading to bacterial imbalance. These challenges can be more difficult to correct without using antibiotics. Take special care when performing procedures that involve bird disturbance (i.e. vaccination).

Ventilation

Achieving the correct ventilation is a key factor in broiler health status. If proper ventilation is not maintained, respiratory diseases can occur, requiring the use of antibiotics for the treatment of sick birds. No matter which ventilation system is being used (natural or power ventilation), it is important that correct system monitoring is being done to ensure that equipment is operating properly and air quality is being maintained. For more information on ventilation for broilers, please see the **Broiler Management Handbook**, as well as the **Aviagen Brief - Minimum Ventilation Rates for Today's Broiler** and the posters- **Minimal, Transitional and Tunnel Ventilation for Broilers**.

Thinning/partial depopulation

If thinning/partial depopulation is practiced, take care to minimize feed withdrawal to the remaining birds and maintain an optimal house temperature. Thinning should be done in as biosecure way as possible by ensuring that equipment used in the catching process is thoroughly cleaned before entering the house. This will help to minimize the introduction of infectious agents. Keep the feed withdrawal period for this process as short as possible to avoid:

1. Flightiness, which can influence skin lesions (some regions catch birds in low light intensities to avoid flightiness).
2. The over-consumption of feed in a short amount of time, which can disrupt feed passage and potentially disrupt the gut, leading to bacterial imbalance and dysbacteriosis.

Nutrition and Feeding

All bacteria have a preferred nutrient source and when there is a feed change (particularly when it involves a change in cereal, protein or fat source), there can be a change in bacterial activity, leading to overgrowth of less favorable bacteria. The alterations in bacterial activity can cause a temporary intestinal disruption. The use of probiotics or organic acids can provide support for the intestinal tract and prevent bacterial overgrowth.

Changes in the gut environment, either due to bacteria or feed ingredients, can cause an increase in viscosity in the mucus layer of the intestines. This change in the mucus environment can provide more favorable conditions for the growth of *Clostridium perfringens*, and in turn, lead to an outbreak of Necrotic enteritis, which will require antibiotic use.

Plant-based diets

One of the key factors that distinguishes the diets of flocks grown without antibiotics is the move from animal based raw materials to all-vegetable diets. Due to the increased possibility of *Salmonella* contamination and Necrotic enteritis when including animal by-products in diets, plant-based diets are recommended for flocks grown without antibiotics or ionophore coccidiostats.

In some countries, diets are formulated using grains with higher levels of non-starch polysaccharides such as wheat and rye. The addition of these grains in different diets throughout the life of the bird can significantly affect the balance of the intestinal microflora and cause intestinal disruption, leading to conditions such as dysbacteriosis and Necrotic enteritis.

Other potentially beneficial feed additives

Some feed additives may be beneficial when feeding a flock grown without antibiotics. These products may provide beneficial bacteria to the gut, have antibacterial properties against gut pathogens and help to stimulate and maintain intestinal tissues. Feed additives to consider are:

- **Prebiotics** – provide a nutrient source to beneficial bacteria in the gastrointestinal tract (GIT).
- **Probiotics** – provide the GIT with beneficial bacteria and have activity against pathogens.
- **Essential Oils** – have been known to have antibacterial properties against pathogens, stimulate gut tissue development and have beneficial effects on the immune system.
- **Organic Acids** - stimulate GIT tissues and modify intestinal flora by favoring acidophilic bacteria and reducing pathogen growth. Some feed additives, such as butyric acid, need to reach the lower intestine to be effective and so need to be coated to be able to pass through the upper intestine without being degraded.
- **Insoluble Fiber** - birds fed insoluble fiber (typically from oat, rice or sunflower hulls) have greater gut-fill, improved immunity and reduced Salmonella, Clostridium perfringens and enterobacteriaceae. Insoluble fiber is proven to increase gizzard development, which is known to improve the function and health of the small intestine, reducing the risk of bacterial overgrowth and dysbacteriosis.

Bird Health

Gastrointestinal (GIT) health

The GIT of the chicken has three predominant stages, development, transition and maintenance, all of which need to be understood to ensure optimal gut health. During the development stage (the first 2 weeks of the chick's life), failure of the GIT to develop properly will impact health and performance for the entire life of the bird. Optimal early GIT development is dependent on proper hatchery management, correct brooding conditions, the presence of feed and clean water, and the introduction of beneficial bacteria into the intestinal tract. The transition stage refers to the time periods where there are fluctuations in the gut environment in response to impacting factors such as a feed change (availability and type), light intensity or duration change, and vaccination. These events can cause a change in the intestinal environment, leading to bacterial overgrowth or reduced nutrient absorption. If the intestinal tract becomes disturbed, there is an increased risk of conditions such as dysbacteriosis or Necrotic enteritis. Understanding when the gut is at risk of becoming imbalanced and supporting the gut accordingly is critical for broiler production without (preventative use of) antibiotics. The maintenance stage refers to the period when the gut has stopped developing and has reached balance. There is still the risk of intestinal imbalance due to impacting factors or pathogen challenge, so it is important to maintain the support of the GIT tissues using the products mentioned in the previous section. For more information on gut health, please see the **Aviagen Brief – Gut Health in Poultry**.

Vaccination

Carefully consider vaccination programs for broilers. It is important to vaccinate against pathogens that present a high background challenge on the farm, but vaccination should only be done if necessary. If vaccinations are given when they are not necessary, it will impact the immune system, which could result in reduced performance and in some circumstances, even make the birds more susceptible to other diseases. The exact vaccination program will vary, taking into account the background disease challenge on the parent farms and the broiler farms where the progeny will be placed. When possible, choose vaccine strains that are the least immunosuppressive. All vaccinations must be given using a standard operating procedure that minimizes discomfort and optimizes the vaccine. Always administer vaccines in accordance with the advice from the manufacturer.

If coccidiostats are not permitted for use, then an effective coccidiosis vaccine will be required and should be administered as early as possible.

Health status of the parent source flock

To produce good-quality broiler chicks, the parent source flocks must be of a good health status. The parent source flock should be free from vertically transmitted diseases such as Mycoplasma and Salmonella and be vaccinated/protected against appropriate vertically transmitted diseases such as Chicken Anemia Virus (CAV), Avian Encephalomyelitis (AE), etc. Good biosecurity and an appropriate vaccination program to prevent infection from diseases that are not vertically transmitted should also be in place.

Parent flock vaccination will also help to provide maternal antibodies that help prevent horizontal infection (infection from the broiler farm environment) in chicks at an early age. This type of prevention is the main function of some vaccinations such as for inactivated Gumboro disease.

Conclusions

Although the current **Broiler Management Handbook** provides a wealth of information regarding best practice management for rearing broilers, some key points to remember when growing broilers with minimal antibiotic use include:

- Closely monitor water quality with TVC <10 cfu/ml and E.coli, enterobacteriaceae, yeast and mold at undetectable levels.
- Keep litter temperature at 28-30°C (82.4-86°F), and use only litter that has been tested or is certified to have a TVC <10 cfu/g.
- Monitor crop fill and 7-day body-weight targets to ensure chicks get off to a good start.
- Achieve the correct ventilation for optimal broiler health.
- If thinning/partially depopulating a flock, minimize feed withdrawal, maintain optimal temperatures and practice good biosecurity to minimize the introduction of infectious agents.
- Plant-based diets are recommended when growing broilers with minimal antibiotic use.
- Pre- and probiotics, essential oils, organic acids and insoluble fiber may be beneficial to production.
- Ensure optimal gut health when rearing broilers without antibiotics.
- If coccidiostats are not permitted, administer an effective coccidiosis vaccine as early as possible.
- Parent-source flocks must be of a good health status and free from vertically transmitted diseases.

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